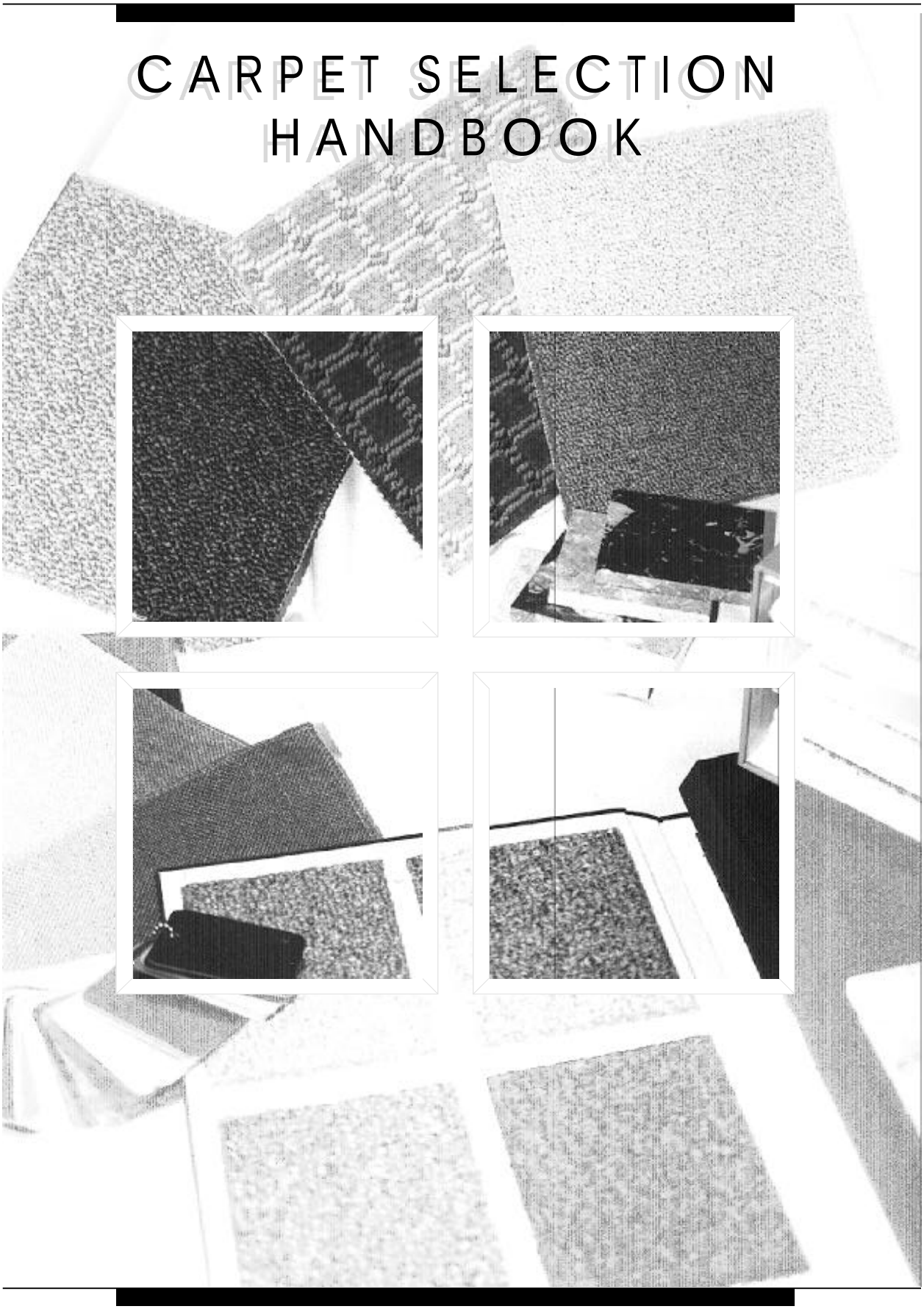
CARPET SELECTION HANDBOOK



Air Force Center for Environmental Excellence

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INTRODUCTION

This handbook is intended to assist in the selection of carpet and carpet tile for use in all types of Air Force facilities except Military Family Housing. It begins with background information on the types of fibers used in carpet making, and continues with a discussion of the various methods of carpet construction, including appropriate applications for the various types of carpet. Chapter 2 contains information on installation techniques along with a discussion of the pros and cons of the various methods. Chapter 3 concerns maintenance. It begins with information on the various types of soil and then discusses the importance of developing a proper maintenance program. Soil prevention techniques and cleaning methods complete the chapter. An extensive glossary of carpet terms provides reference information for the handbook, and is followed by a bibliography of references for those wishing to further expand their knowledge of carpets.

1 CARPET CONSTRUCTION

The performance of a carpet is largely a matter of appearance retention. A carpet is initially selected because of its appearance (aesthetics), and its performance is judged on how well it retains that original appearance. Carpets manufactured today will suffer unacceptable deterioration in appearance before suffering unacceptable wear. How well a carpet will maintain its original appearance under normal wear and maintenance is one of the primary considerations in selecting new carpet. There are several factors that affect appearance retention/performance. Almost every carpet component and every part of the manufacturing process has an impact. The critical variables in carpet construction are: (1) pile fiber, (2) carpet construction method, (3) choice of backing, and (4) color, pattern and finishes. Each of these variables is discussed below. The fifth critical variable in carpet performance is maintenance, which is discussed in Chapter 3.

PILE FIBER

The basic element of any carpet is the fiber that is converted into yarn and tufted or woven to form the pile. Almost all carpet manufactured in the United States today is made from one or a blend of the five fibers listed below:

- Wool
- Acrylic
- Nylon
- Olefin (polypropylene)
- Polyester

Each of these fibers has positive and negative characteristics which should be considered in carpet selection.

Wool

Wool is the carpet fiber that has been in use the longest. It is the only natural fiber in extensive use, and is the standard by which synthetic fibers are judged, although it represents only a fractional part of the commercial market. It has inherent resiliency, and does not hold dirt and surface dust readily because of the scaly character of the fiber. In addition, it is naturally flame resistant, charring rather than melting or dripping. Its major disadvantage is the high initial cost. Lower cost wool blends have become popular in recent years. A common blend is wool/nylon, at a recommended ratio of 80% Wool to 20% Nylon.

Acrylic

Acrylic fibers have been little used in carpet recently. Acrylic is wool-like in appearance, but soils and mats easily. It is not recommended for commercial applications.

Nylon

Nylon is used for 70% of commercial carpets. Of the synthetic fibers, it is the strongest, the most resilient, and offers the best performance characteristics. It is resistant to abrasion, has the greatest resistance to crushing and matting, and is easy to maintain. Since it takes dye well, it also has the greatest styling flexibility. Carpets are made of either Type 6,6 or Type 6. The two types have different molecular constructions. Type 6 is softer and easier to dye, and Type 6,6 is harder (more resilient) and more stain resistant.

Most nylon manufactured in the United States is made by one of the following companies, and most carpet manufactured in the United States is made from nylon fiber produced by

one of these firms. Fibers produced by these firms are referred to as branded nylon, and are available to any carpet manufacturer. They are well understood and their performance is well documented. Non-branded nylon fiber should be specified only with extreme caution and after careful research. The primary branded nylons are:

Brand	Type
Monsanto Ultron	Type 6,6
Dupont Antron, DSDN, Pro Select	Type 6,6
ICI (Rarely seen in the United States)	Type 6,6
BASF Zeftron	Type 6
Allied Anso	Type 6
Camac Camalon	Type 6

Olefin (Polypropylene)

Olefin is a synthetic polymer fiber whose base is ethylene, polypropylene, or a similar substance. It has excellent strength and resistance to chemicals and is highly moisture and stain resistant. It is usually solution dyed. Olefin is very low in resilience, crushes and packs quickly, and is not recommended for heavy traffic or extended wear areas. It is somewhat less expensive than nylon and is recommended for projects with tight budgets or for short term installations.

Polyester

Polyester has excellent color clarity, retains its luster well, and is resistant to water soluble stains, but its crush resistance is poor. Polyester is more commonly used for residential carpet.

FIBER PERFORMANCE CHARACTERISTICS

Characteristic	**Branded Nylon**	**Olefin**	**Polyester**	**Wool**
Color	Excellent	Limited	Good	Limited
Abrasion Resistance	Excellent	Excellent	Good	Fair
Resilience	Excellent	Poor	Poor	Excellent
Soiling	Very Good	Good	Fair	Good
Cleaning	Very Good/Good	Excellent	Fair/Good	Good
Spot Removal	Fair/Good	Excellent	Good	Fair/Good
Pilling	Excellent	Excellent	Poor	Good
Static Electricity	Poor/Very Good	Good	Good	Bad/Good
Allergy Problems	Good	Good	Good	Fair
Chemical Resistance	Good	Good	Good	Fair

CONSTRUCTION METHODS

There are many different carpet construction methods in use today. The construction method of a carpet has a major effect on the performance and appearance of the carpet. There are three carpet construction types acceptable for Air Force projects. These are tufted, woven, and fusion bonded.

Tufting

Tufting is the most widely used construction method. In tufting, loops of yarn are punched into a primary backing material and locked on the underside with a secondary latex backing. Tufted loop pile carpet has a greater potential for snagging and running than woven carpet.

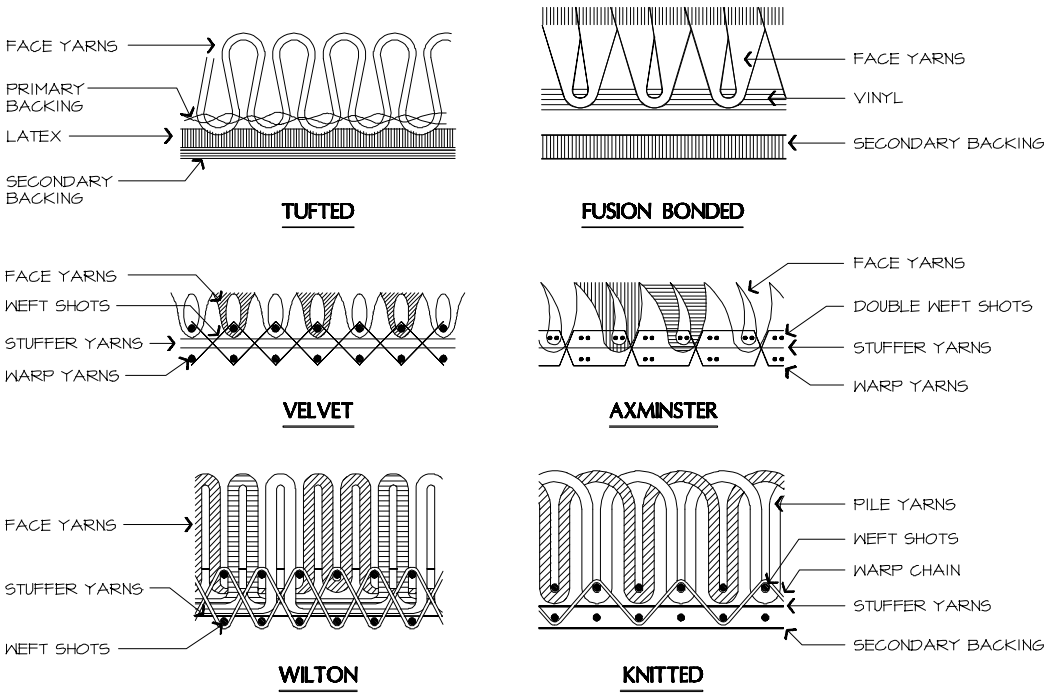
Weaving

Weaving is the second most popular method of construction. The pile yarns are interlaced in one of many different techniques, each of which gives a different appearance to the carpet. Woven carpets are generally more expensive than tufted carpets, but have better appearance retention. Woven carpets also require less pile weight to achieve the same performance as tufted carpet. Some types of woven carpet are Velvet, Wilton, Axminster, and Knitted.

Fusion Bonding

Fusion bonding is a newer method of construction than tufting or weaving. Yarn is embedded between two parallel sheets of adhesive coated backing, which are then split apart, forming two sheets of cut pile carpet. This type of carpet has a higher density so it usually performs very well. Bonded carpet is available in both carpet tiles and six foot or twelve foot wide roll goods.

Construction Modes



Performance Factors

There are several variables in carpet construction which affect wear and appearance retention and which are measurable. These performance factors are discussed below.

Density

Carpet density is a key factor in soiling and resiliency. In an adequately dense pile, dirt will remain on the surface so that it is easily vacuumed away. In addition, more compact fibers are less likely to crush since the tufts tend to support each other in the upright position.

Density is determined by the number of tufts (stitches) per unit area and the size of the yarn in the tufts. These factors are called gauge, pitch, stitches per inch, and yarn count. Pile density is the amount of pile yarn in a given area of carpet face. A useful formula is:

$$\text{Average Pile Density} = \frac{36 \times \text{Pile Yarn Weight}}{}$$

Pile Height

See Table 2 in the ETL 94-3 Air Force Carpet Standard for recommended density factors.

Gauge

The gauge of a tufted carpet is the number of tuft rows (rows of stitches) across a unit width of carpet. Gauge is obtained by counting the number of ends of yarn in one inch across the carpet and then taking the inverse of that number (I. e. one over the number.) For example, if a tufted carpet has eight ends of yarn per inch, the gauge is 1/8. If it has ten ends of yarn per inch, the gauge is 1/10. The smaller the gauge, the more dense the carpet. 1/10 gauge (10 tufts per inch of width) is more dense than 1/8 gauge (8 tufts per inch of width). Tufted carpet should have a minimum of 1/8 gauge or 1/10 gauge for good appearance retention.

Pitch

The density of woven carpet is described in terms of pitch. The pitch of a carpet is obtained by counting the number of ends of yarn in 27 inches of width.

To convert gauge to pitch, take the inverse of the gauge and multiply by 27. For example, if the gauge is 1/8, taking the inverse gives 8, and multiplying by 27 gives a pitch of 216. To convert pitch to gauge, divide the pitch by 27 and then take the inverse.

A good method of comparing carpets is to bend each carpet as it would be bent over the nosing of a stair tread and compare the amount of backing material exposed. Better carpet will have closer spaced tufts.

Stitches per Inch

Density is also affected by the number of stitches per unit length of tuft row. The number of stitches (tufts) per running inch of carpet is usually specified directly for tufted carpet, but is called "rows per inch" for woven carpet.

Multiplying tuft rows per inch of width by stitches per inch of length will result in the number of tufts per square inch, or tuft density. Equal tuft placement gives the best performance, i.e., stitches per inch of length should be approximately equal to rows per inch of width. A high quality tufted carpet should have a minimum of 56 tufts per square inch.

Yarn Count, Twist, and Heat setting

The yarn count (or size) is an important factor in determining carpet quality. The larger the yarn for a given construction and pile density (that is, the more weight per unit length), the denser and heavier the carpet will be.

Yarn twist and heat setting are extremely important for cut pile carpets. The yarn is first twisted and then heat set, giving it a springy character. This gives the carpet resiliency, enabling it to spring back when stepped on. A loose twist or a poor heat set will cause the carpet to mat and tangle. Five or more twists per inch is recommended for good appearance retention in cut pile carpet.

Pile Height

Pile height in tufted or bonded carpet is measured from the primary backing to the top of the tufts. In woven carpet it is the measurement between the steel blades on the loom on which the tufts are formed. If the carpet is multilevel, all pile heights should be specified. A low level loop performs best for severe wear applications, while a high pile gives a feeling of luxury. Carpets with low, dense piles will crush less than those having higher piles.

Pile Yarn Weight

Yarn weight is the amount of yarn, including buried portions of the pile yarn, that is contained in one square yard of carpet. This weight is usually given in ounces. Since some yarn is lost in production, the specifier may want to determine if the weight given is

the finished weight or the tufting specification. Pile yarn weight should not be confused with total finish weight. The total finish weight includes all backing materials, latex, foams, topical finishes, and face yarns, and is not necessarily indicative of quality.

Surface Texture

The texture of a carpet is the combined effect of the visual and tactile surface characteristics. Surface texture is not merely an aesthetic factor, but also impacts the appearance retention of carpet. The most common textures are defined below:

- Level Loop Pile: Single level, uncut loop pile that makes a smooth and level surface. It offers excellent wear resistance, but shows dirt, stains, and lint easily.
- Multi Level Loop Pile: This texture is constructed with two or more different height loops. The texture hides footprints, dirt, and dust better than a level loop, but may show crushing and compression with wear. Sometimes a pattern is created using the different heights of tufts, or the levels may be random, creating a texture.
- Cut Pile: This type of carpet has an upright pile with cut ends. This forms an even surface that is subject to shading, the illusion of color change caused by bent yarns reflecting light in different directions. The specifier should examine the cut pile carpet from several different angles and directions if color is critical. Difference in the amount of twist in the yarn creates different looks, such as:

  a) Plush Finish: Made from yarn with very little twist which leaves a very smooth finish surface where tuft ends blend together. It is sometimes called "velvet plush." Velvet plushes show shading depending upon how light hits the pile. Shading is normal for this style and adds richness to the color.

  b) Saxony: Uses yarns of two or more plies, twisted together and heat set to lock the twist into the yarn, thus giving it stability and permanency. This results in a distinctive appearance quite different from velvet plush because each tuft end is distinguishable on the surface.

  c) Frisé: (Pronounced free-zay) Composed of tightly twisted, well defined yarns that give an overall nubby or pebbly texture. Carpets of frisé design wear well and do not have the pronounced shading effect that other cut piles exhibit.

  d) Shag: A carpet texture characterized by long pile (1 1/2" to 3") tufts laid over in random directions in such a manner that the sides of the yarn form the traffic surface. Modern shags are made from plied, heat set yarns and can be either cut pile or cut and loop styles.

- Cut and Loop: An infinite variety of surface textures can be achieved by combining cut pile with loop pile. Tip sheared, random-sheared, and sculptured effects can be achieved by combining different loop heights and varying the cut pile areas.

CARPET BACKING

Carpet backing gives carpet dimensional stability. The term backing has a different meaning for woven carpet than it has for tufted carpet.

Woven Carpet

Backings for woven carpets consist of yarns called stuffers that are interwoven with the face yarn during the construction process. Polypropylene yarn is used as the primary backing for woven carpets. A latex backcoating or foam is added for maximum stability. Since the yarns are interlocked components of the carpet, a secondary backing is not

required. Woven carpet is not subject to the delamination and long yarn runners that can affect tufted carpeting.

Tufted Carpet

In tufted carpet, the primary backing is woven or non-woven fabric into which the pile yarn is inserted by the tufting needles. A secondary backing of woven or non-woven material is adhered to the underside of the carpet, providing additional tuft bind and dimensional stability. Secondary backings are usually made of jute or man made materials such as polypropylene, latex foam, thermoplastics or vinyl. For carpet tiles, polyvinyl chloride, amorphous resin, ethylene vinyl acetate, polyethylene, asphaltic bitumen, or polyurethane are used. Jute backing is not recommended under any circunstances since it is an organic material subject to mildew, odors, bacterial growth, stretching, delamination, and deterioration. Jute should be especially avoided in climates with high humidity.

Unitary backing is another type of tufted carpet backing. It consists of a chemical backcoating without an added secondary backing. Unitary backed carpet is most appropriate for glue down installations.

Tests for Carpet Backing

There are several tests performed on carpet backing that indicate quality and suitability for a particular application.

- Tuft bind: Tuft bind is the amount of force required to pull a tuft from the carpet. This measurement is important to consider when selecting carpet for high abuse areas such as schools or child development centers where there is a potential for unraveling. The minimum tuft bind, in average pounds of force, should be 10 pounds on any single pull, 12 pounds average on 8 pulls for loop pile, and 3 pounds for cut pile. Testing is done according to ASTM Method D1335-67, "Tuft Bind of Pile Floor Coverings."
- Peel Strength of Secondary Backing: Testing is done according to Federal Test Method Standard 191, Textile Test Method 5950. The minimum acceptable peel strength is 3.35 pounds/inch.
- Dimensional Stability: A suitable test for measuring the stability of finished broadloom carpet has not yet been developed. Dimensional change is rarely encountered with glue down installations, and is seldom a problem when power stretched carpets are properly installed. A dimensional stability test for carpet tiles is the Aachen Test. It consists of four individual tests in both the machine direction and the cross direction. The required result is the average of the four tests and should be +/- 0.027.
- Tear Strength: Testing is done according to ASTM D2261-64 "Tearing Strength of Woven Fabrics." The minimum acceptable tear strength in both length and width is:

  Carpets for Glue Down Installation: 25 lb.

  Carpets for Power Stretch Installation: 35 lb.

COLOR, PATTERN, & FINISHES

The choice of carpet color has a major impact on the interior of a space. While choice of color is at the discretion of the specifier, color is also an important factor in appearance retention.

Observations on Selecting Carpet Color

- Color is the dominant impact of carpeting.

- The floor is the second largest color area in the interior.
- Color is affected by the kind of light it is seen in - daylight, incandescent light, or fluorescent light.
- Color is affected by the amount of traffic the carpet receives and how soiled it is..
- Extremes of color magnify soiling.
- Yellow, gold, and tan show more soiling.
- Patterns and mixtures of color show less soil than solid colors.

Color can be applied to carpet fiber at any one of three different times during the manufacturing process: before spinning the yarn, after spinning the yarn, or after weaving the carpet.

Dyeing Before Yarn is Spun

- Solution Dyed: The fiber is dyed in its liquid state before it is spun into yarn. The color becomes a permanent part of the fiber and will not fade or bleach out. The pre-colored fibers are supplied to the carpet mills by the fiber manufacturers. This method is common for olefins (polypropylenes), nylons, and polyesters.
- Stock Dyed: After the fibers are made, they are dipped into a bath of dye where heat and pressure force color into the fiber before it is spun into yarn. There is a wide range of color choices, but fibers dyed with this process are more susceptible to fading, bleaching out, and staining. This method is used in dyeing wool, acrylics, polyesters, and some nylons.

Dyeing After Yarn is Spun

- Skein Dyed: Yarns are spun into skeins, which are stored and dyed as orders are obtained. This method can be used for spun yarns, bulked continuous filament yarns, heat set yarns, and non heat set yarns of almost any fiber type.
- Package Dyed: This method is similar to skein dyeing, except that the yarns are wound on perforated packages and the dye stuff is forced under pressure from inside the package through the yarn. Package dyeing is used infrequently for carpet yarns.
- Space Dyeing: The yarn is treated with three or more colors along the length of the yarn. This gives the carpet pile a random pattern. There are three methods of space dyeing: *knit-print-deknit*, *warp sheet printing*, and *multicolor skein dyeing* (similar to the skein dyeing process described above).

  a) In the knit-print-deknit method, yarn is knitted into a tube or sock which is printed on both sides, usually in diagonal and horizontal stripes. The sock is then unraveled, and wound onto tufting cones. Knit-print-deknit is often used for loop style, contract carpet.

  b) In warp sheet printing, yarns are unwound from a beam and carried side by side under the print rollers that apply the diagonal and horizontal stripes in varying widths. The yarn is then wound onto cones. Warp printed yarns tend to be straighter and leaner than knit-deknit yarns. This method is well suited to cut pile and cut loop carpet.

Dyeing After Carpet is Woven

- Piece Dyeing: Color is applied from a dye beck (stainless steel tank) onto unfinished carpet consisting only of primary backing and undyed yarns. Piece dyeing is generally for solid colors, but a tweed or moresque effect can be achieved in a single dye bath

by treating some fibers to accept or reject certain dyes. Piece dyeing is generally associated with nylon and polyesters.

- Batch Piece Dyeing: This is similar to piece dyeing but the carpet is moved in and out of the bath by a motorized reel.
- Continuous Piece Dyeing: Dye is applied via a polished roller rotating in a continuously fed, full width dye trough. The full width of the carpet moves under the applicator. Continuous piece dyeing requires great skill and operational care.
- Random Multicolor Dyeing: This is similar to continuous piece dyeing but the applicators are modified to control the flow of dyestuff. This method creates random, multicolored patterns. The machines for this process were developed by the Kusters Corporation of Germany, and are called TAK or Multi-TAK applicators.
- Printing: Carpet printing is similar to textile printing but uses larger machines. There are three methods of printing - *roller printing*, *screen printing*, and *jet printing*. Printed carpet can simulate woven patterns at a much lower cost.

  a) In roller printing the carpet is placed on a moving belt and dye is squeezed from a roll or drum through a pattern attachment.

  b) In screen printing the carpet is placed on a flatbed and the dye stuff is forced through screens by an electromagnetic system.

  c) Jet Printing: In jet printing, jets intermittently inject color into the carpet pile in response to signals sent by a computer. Designs are stored on magnetic tapes, and can be changed instantly. Jets can be used for continuous solid color dyeing, random patterns similar to those produced by TAK applicators, controlled geometric patterns, and oriental or other formal patterns.

Color Fastness

Dyes applied to carpet pile yarns are subject to chemical attack and the action of sunlight and atmospheric contaminants such as ozone and nitrogen oxides. There are several tests to assure that dyes are properly fixed on the pile yarn, that they will resist fading, and that they will not rub off when dry or bleed when wet. Dyes should also be unaffected by accepted industry cleaning methods. Carpets that meet the following standards can be expected to offer acceptable fade resistance in indoor applications.

- Light Fastness: AATCC Test Method 16E-1976. Shade changes after 80 standard fading hours (Xenon Arc) should not be less than an International Gray Scale Rating of 3.
- Crock Fastness: AATCC Test Method 8-1974. Minimum stain ratings, International Gray Scale, should be Wet: 4, Dry: 4.
- Wet Fastness: Dupont Carpet Spot Bleed Test. Run with both hard water and alkaline detergent. Stain or color change rating after two cycles in either test, should be no less than an International Gray Scale Rating of 3.
- Atmospheric Fading: AATCC Test Method 129-175. Ozone/AATCC Test Method 23-1975 - Burnt Gas. Minimum shade change after two cycles in each test should be no less than an International Gray Scale Rating of 3.

Patterned Carpet

Patterned carpet contains decorative ornamental or abstract forms and shapes. The pattern may be an integral part of the construction or may be applied through a printing process.

Pattern can be incorporated through texture, color, or the combination of both. Patterns can enhance appearance retention by acting as a camouflage. They hide seams, mask soiling, and obscure traffic patterns.

In assessing carpet designs for appearance retention, random patterns are best, followed by regular geometric patterns, tweeds, heathers, and solid colors. Tweed designs contain two or more colors that are interwoven. They may be used where heavy soiling is not anticipated. Heather designs are similar to tweeds but much more subtle. The multicolor effect in heathers and tweeds is produced by blending fibers of different colors prior to spinning the yarn. In a tweed, the multicolor effect is more pronounced because the actual yarn tufts are multicolored. In both cases, the more colors used the better the appearance retention that is achieved. Multicolored (more than two or three colors), patterned, and/or tweed carpet should be used for all high traffic areas that are subject to stains and spillage such as dining halls, child care centers and clubs. Solid carpet is only recommended for General Officers' office suites and distinguished visitors' (DV) areas in transient lodging facilities.

Observations on the Use of Pattern

- Avoid orienting geometric carpet patterns with predominant lines parallel to walls in areas of long proportion such as corridors, unless the pattern is installed as an inset. This prevents the appearance that the carpet is running askew to the walls and will also make the corridor appear longer.
- Be aware of the scale of the carpet pattern. Large scale patterns should generally only be used in large areas such as ballrooms, dining rooms, etc.

In areas where cigarettes or boot polish may be a problem, a carpet containing black, dark blue or dark brown in the pattern helps to camouflage any burns or stains.

Antimicrobial, Soil Resistant, and Stain Resistant Finishes

Chemical finishes are a recent innovation that has greatly improved appearance retention and ease of maintenance for carpeting. These finishes include soil resisters, stain resisters, and antimicrobial treatments. These protections should be built in so that the finish is permanent and never requires reapplication due to moisture, shampooing, or steam cleaning. Solution dyed carpet is inherently stain resistant. Antimicrobial treatments should be registered with the United States Environmental Protection Agency (EPA) for the express purpose of providing protection.

It should be noted that carpets will still require maintenance programs to preserve their appearance. No antimicrobial treatment will overcome unhygienic conditions of spilled food and dirt left unattended, and a soil resistant finish does not mean that a carpet is soil proof. A good maintenance plan is mandatory for all carpets.

2 INSTALLATION

A quality installation provides long lasting value, performance, and satisfaction. Installation should be performed by an installer approved and certified by the carpet manufacturer or by an experienced installation technician. The Carpet and Rug Institute has published a guidebook called How to Specify Commercial Carpet Installation. Carpet specifiers should refer to this volume and to CRI-104, Standard for Installation of Commercial Textile Floor Covering Materials for comprehensive installation information. These guides are available for a small fee through the Carpet and Rug Institute:

The Carpet and Rug Institute
PO. Box 2048
Dalton, Georgia 30722
(706) 226-2477 or (706) 278-3176

There are three principal methods of commercial carpet installation: *stretch-in*, *direct glue down* (including attached cushion), and *double glue down*. Carpet with attached cushion, secondary, unitary, or woven backing may be used for glue down installations. Separate cushion stretch-in installations are usually limited to woven carpets or tufted carpets with secondary backings.

The following issues should be considered when installing carpet:

Pattern Match - Extra carpet must be allowed when estimating quantities of patterned carpet needed. Even cut and loop effects, such as sculptured carpet, require matching.

Seaming - Care should be taken to avoid seams in high traffic areas such as doorways, hallways, and pivot points.

Stretch-in Installation

In the stretch-in method, carpet is stretched over a separate cushion using tackless strips at the outer edges of the area to hold the carpet in place. There may be problems with wrinkling or buckling, usually resulting from insufficient stretch during the initial installation, or from a cushion that does not adequately support the carpet. Adequate stretch can only be attained by using power stretchers. A firm, low profile cushion with small deflection should be used in commercial traffic areas. Cushions that are too thick and soft will permit carpet backings to stretch and eventually wrinkle.

Additional information concerning the correct amount of stretch for each carpet and the preferred type of cushion should be obtained from the carpet manufacturer prior to stretch-in installations.

Good seams are of the utmost importance for a quality installation. The manufacturer's recommendations must be followed closely. Most modern installations employ hot melt tape seams, but woven carpet constructions may require hand sewing or other specialized techniques. In all cases, cut edges should be buttered with the appropriate sealer prior to seaming.

Direct Glue Down & Double Glue Down Installations

Installations using adhesive can be made using carpet with an attached cushion or carpet without an attached cushion. Adhesive installations are better suited than stretch-in installations to heavy and rolling traffic conditions. Adhesive installations are also better suited to large open areas because of the considerable difficulty of stretching carpet over a large area.

Direct Glue Down Installations

This type of installation is used for carpet with or without an attached cushion. Carpet without cushion is inexpensive and provides adequate wear, good dimensional stability, ease of use for rolling equipment, and good stability for standing partitions in direct glue down installations. Carpet with an attached cushion provides good wear, greater softness underfoot, and better acoustics than carpet without an attached cushion. The cushion may break down, however, under severe wear conditions or when subjected to wheeled equipment traffic. If the cushion breaks down, the carpet may need to be replaced sooner.

Double Glue Down Installations

Double glue down installations combine cushion and carpet into a floor covering system by gluing the cushion to the floor and the carpet to the cushion. This method is popular since it combines the stability of direct glue down with the cushioning benefits of a separate cushion. The cushion must be a type that is designed for this method.

In both types of glue down installation, adhesive is applied to the floor to obtain the required 100% adhesive transfer into the carpet back. If too little adhesive is used, carpet will not adequately adhere to the floor. It is also very important to allow adequate open time for adhesives to develop tack prior to laying carpet. Ensure that proper glue and tape are used.

Moisture Problems

Moisture can prevent adhesion of carpet to floors, and can be present in both concrete and wood subfloors. It is extremely important to test for and correct moisture problems prior to glue down, since moisture may carry alkaline substances that can attack adhesives and destroy the bond between the floor and the carpet.

Indoor Air Quality

There has recently been a good deal of concern about indoor air pollution, which has led to questions about the relationship between carpet products and indoor air quality. Indoor air quality can be improved by taking the following steps during installation:

- Plan ahead.
- Ask the carpet supplier for information on emissions from carpet.
- If adhesives are needed, request low emitting ones.
- Use low VOC (volatile organic compounds) adhesives in all glue down installations.
- Use low VOC (volatile organic compounds) adhesives in all carpet tile installations.
- Ensure that the ventilation system is in full working order before installation begins.
- Be sure the supplier requires the installer to follow Carpet and Rug Institute installation guidelines.
- Open doors and windows, if possible, during and after installation.
- Consider using window fans, room air conditioning units, or other means to exhaust emissions to the outdoors.
- Operate the ventilation system with maximum outdoor air during installation and for 48 to 72 hours afterwards.
- Consider leaving the premises during and immediately after carpet installation. Schedule the installation for a time when most people will be out of the facility.

- Contact the carpet supplier if objectionable odors persist.
- Follow the manufacturer's instructions for proper carpet maintenance.

CAUTION: Some carpet tile backings have an adverse chemical reaction when they come into contact with the cut back adhesive that is used to install vinyl composition tile (VCT). Be careful to remove all adhesive from floor or to install carpet tile on top of VCT. This procedure will avoid the breakdown of the carpet tile backing and subsequent wicking of adhesive to the surface of the carpet tile.

Choosing an Installation Method

Advantages of the Stretch-in Method:

- Patterned carpet is more easily matched
- Stretched carpet is more resilient than carpet that has been glued down.
- It extends carpet life.
- There is less crushing and packing of pile.
- It adds insulation value.
- It gives higher sound absorbency (NRC) values.
- It responds better to vacuuming.
- It can be used for floors that are not acceptable for glue down.
- Removal costs less than removal of a direct glue down installation.
- Corrective measures, such as seam repair, are easier to perform.

Advantages of the Direct Glue Down Method:

- The cost of the cushion is eliminated.
- The labor for direct glue down is usually lower in cost.
- It is suitable for rolling traffic and ramp areas.
- The seams are more durable since there is no vertical flexing.
- Buckling is minimized in buildings that have the HVAC turned off for extended periods, such as schools, churches, theaters, etc.
- Restretch is never necessary.
- It facilitates access to electrical and telephone lines under the floor.
- Seam peaking is practically eliminated.
- It is unrestricted by the size of the area, and is therefore suitable for large areas such as ballrooms, etc.
- Intricate borders and inlay are possible.
- It is better for handicapped accessibility.

Advantages of Direct Glue Down with Attached Cushion Method:

- Appearance retention and foot comfort are improved over direct glue down installations.
- Has high tuft bind capabilities.
- There is increased delamination strength and improved edge ravel resistance.
- It functions as an effective moisture barrier.
- Thermal and acoustical performance are improved.
- The second adhesive required for double glue down installation is not necessary.

Advantages of the Double Glue Down Method:

- It combines the stability of direct glue down carpet with the cushioning benefits of separate cushion stretch-in installations.
- It improves carpet appearance retention, foot comfort, and overall performance over direct glue-down installations.
- Carpet bordering and inlaying are simplified.
- It is suitable for wheeled traffic.
- It is unrestricted by the size of the area.

3 SUSTAINABILITY

The notion of recycling carpet has become increasingly popular for at least two reasons. One is the realization that a relatively large amount of energy is used in the manufacture of carpet. A second reason is the growing sensitivity to the vast amount of material currently being placed in landfills.

Recycling

Seventy percent of all new carpet manufactured will be used to replace existing material. Every year between three and a half and four billion pounds of carpet is discarded and sent to landfills. This amounts to one percent of solid waste by weight and two percent by volume. Each of these is a tremendous amount when you consider that carpet is just one of millions of products placed in landfills every day.

Virgin nylon is the most valuable resin used to make new carpet (fibers). While the resin itself is relatively inexpensive, the manufacturing process in energy intensive (especially in the use of fossil fuels). In addition, the resin is made from petrochemicals. This makes it somewhat precious from the standpoint of the use of natural resources. So it is generally assumed that to reclaim the nylon will be a primary driver in the recycling of carpet.

RECLAIMING

Unfortunately, the broadloom carpet that we've become accustomed to covering the floors (wall to wall) of our homes and offices with is difficult to recycle. Currently only about one percent of used carpet is being recycled. First the used product has to be collected and transported to a facility for processing. Then the nylon fiber has to be separated from the backing (usually polypropylene fabric and SB latex), the adhesive used for installation and dirt that has accumulated in it over time. Then the fibers must be reprocessed into a resin of such a quality as is required for making new carpet fibers. There are various technologies that have been developed for these purposes but none is easy or inexpensive. It is difficult to make economic sense of recycling carpet as long as it is less expensive to buy virgin nylon and then to landfill it than it is to reprocess old carpet. Finally there is still a lot of material (e.g. the backing materials) which is of little value that is left over once the nylon is reclaimed.

Manufacturers

Most recycling of broadloom carpet is currently being conducted by the manufacturers of the nylon. There are four major makers in the U.S.; DuPont, Monsanto, AlliedSignal and BASF. BASF and AlliedSignal both make fiber of nylon 6 which is considered to be simpler and easier to reprocess than the more complex nylon 6,6 made by DuPont and Monsanto. Both DuPont and BASF have begun collection programs and are processing used carpet commercially.

Reclamation

DuPont's Partnership for Carpet Reclamation is a collection program which has been in operation since 1991 and has expanded to a network of 61 collection sites. They expected to take back and process 28 million pounds of carpet in 1997 including any carpet removed by their network of retailer regardless of whether it was made with DuPont nylon or not. The dealers do charge to remove the old carpet but the cost is intended to be in line with the cost of alternative disposal methods (i.e. landfill). This program is a step in the right direction but is not truly closed loop recycling since the nylon is sold for uses other than new carpet. Thirty to thirty five percent of the carpet collected ultimately becomes "under the hood" auto parts (Ford has made a significant commitment) like air cleaner housings. Some becomes fibrous padding and soundproofing and five percent goes to a waste-to-energy incinerator.

In 1994 BASF committed to take back any carpet made with their own face fiber through their 6ix Again Program. But the necessary identification tags have only been attached to their product since the program began so not much has been collected. They only have six collection sites, can't promise to take the carpet back for less than the cost to landfill it and reserve the right to incinerate what they don't reprocess.

3rd Party Recycling

A couple of other players have made contributions toward the success of recycling carpet. United Recycling , Inc. in Minnesota's Twin Cities area is working on various technologies for reprocessing carpet and are close to commercialization of a new mechanical process for "decomposing" carpet into its constituent fibers. They currently process used carpet for both DuPont and BASF and can process more than a million pounds per month at their Minnesota plant.

Shaw Industries, Image Industries and Talisman Mills are using recycled polyester or PET (soda bottle plastic) to manufacture new residential carpet. Shaw and Hoechst Celanese are testing an all polyester product (i.e. face fiber and backing) which could be easier to recycle for other purposes and will only use virgin resin to make the new carper.

ENVIRONMENTAL ISSUES

Other carpet related environmental issues are the fiber dyeing process and indoor air quality (IAQ). The traditional "piece dyeing" process produces lots of contaminated wastewater. Continuous "solution dyeing" is becoming more common and is less wasteful of water. The IAQ concerns center around the SB latex secondary backing and SB latex-based adhesives commonly used in glue-down installations. The SB latex off-gasses volatile organic compounds (VOC's) like styrene and PC-4. Some manufacturers like W.F. Taylor and the Henry Co. sell only low VOC adhesives (about 5% more expensive to install than more common types of adheasive).

Indoor Air Quality

The Carpet and Rug Institute has instituted an indoor air quality testing program (ASTM-D-5116). As a part of the program, CRI has established criteria defining the maximum allowable VOC emissions from new carpet. Manufacturers whose product meets the criteria can display the green CRI indoor air quality program sticker on their product.

Design Challenges

Interior designers can mitigate the environmental impact of carpet use through some careful choices early in the design process. First, consider whether a particular space really needs to be carpeted. Perhaps a hard floor softened by an area rug of natural fibers would suffice. Try to avoid using carpet at entrances where they can collect toxins, dirt and other irritants or allergens. Consider the use of carpet tile instead of broadloom carpet.

Carpet Tile

Carpet tiles offer some distinct environmental advantages over broadloom carpet. First, it can be replaced incrementally instead of all at once and so help limit the amount that must go to a landfill. The products of the major manufacturers are installed using integral "peel and stick" adhesives which off-gas much less than conventional paste adhesives. Usually the backing material is PVC or olefin which are easier to recycle than the common broadloom backings. In addition the carpet tile manufacturers are addressing environmental issues with their products more effectively than the broadloom industry.

Milliken, through their Earthwise Ennovations program will take back their own "worn out" tile and resurface it for resale. Recognizing that old tiles are usually (80-90%) in fine shape except for dirt, discoloration and compression of the face fibers, Milliken has developed a process to deep clean the tiles, retexture the surface and then overprint a new pattern on top of the existing color. They have the capacity to resurface millions of yards a year and the refurbished product costs only about half as much as new.

In 1995 Collins & Aikman initiated a program through which they make lower-value products like traffic stops and industrial flooring from old carpet. Now they have gone a step further and take back used carpet tile from any manufacturer and make backing for new carpet tile which is of 100% recycled content. Old carpet is ground, size reduced, blended with post-industrial manufacturing waste and then re-extruded as what amounts to a PVC backing reinforced with short nylon fibers from the old facing. They call the new backing ER-3 and sell the product at the same price ($17-$23 / yard) and with the same warranty as their conventional product.

RENEWABLE RESOURCES

Interface Flooring has taken a long term approach to environmental issues looking for ways to use renewable resources and financial incentives to achieve true closed-loop recycling. They've initiated the first program to lease new carpet (instead of selling) to customers. Through this program, the customer pays a monthly stipend for installation, cleaning and replacement of old carpet and the manufacturer takes ultimate responsibility for their own product forever. In addition Interface is pursuing other initiatives like establishing a worldwide network to minimize transportation requirements. In partnership with others, Interface is developing a process for cryogenic (deep freeze) grinding of PVC, allowing carpet tile backing to be more easily and efficiently recycled and working with a Canadian source for the fiber, they are developing a broadloom carpet made entirely from hemp.

Performance Specification Requirements

When broadloom carpet is the appropriate choice for floor covering, it's environmental impact can be mitigated through requirements in the specifications. Consider including the following provisions:

1. Require safety warranties ensuring indoor air quality.
2. Require material bearing the CRI label for IAQ.
3. Specify only low-VOC adhesives and seam sealers.
4. Require old carpets to be cleaned before removal (to allow offering to charitable organizations).
5. Require maximum ventilation during installation.
6. Require a ventilation period after installation to flush initial VOC off-gassing and allow as long as possible before occupying the space.
7. Clean the new carpet before occupying the space.

4 MAINTENANCE

A good maintenance program is essential to the performance, life, and beauty of carpet. Good carpet maintenance also contributes to good indoor air quality. Both preventive maintenance and corrective maintenance must be performed in order to prolong appearance retention.

Types of Soil

In order to understand how to keep carpet clean, it is helpful to understand dirt and soil. Dirt is the substance that causes soiling just as spills cause staining. Soil is what is seen as visual contrast. That is why spots and spills stand out in contrast to the carpet. Similarly, heavy traffic areas will appear darker than adjoining areas of carpet. An effective soil management program must deal with two types of soiling: real soiling and visible soiling. Soil gets into the carpet in three ways: it is tracked in, it is deposited from the air, and it is spilled directly on the carpet.

Tracked in Soil

Tracked in soil represents 80% or more of the soil deposited on carpets at entry points. Shoe soles track dirt in from outside, and it is dispersed throughout the carpeted area over a period of time. Tracked in soil particles are usually oily and small in size. If the dirt is not removed as it is deposited, it builds up in the carpet and causes scratches and abrasion damage. This accumulated dirt flattens the fibers and tufts, resulting in a crushed and matted carpet.

Airborne Soil

Airborne soil is made up of very small dust particles, volatitlized oils, industrial wastes, auto emissions, tobacco smoke and other air pollutants such as pollens, human skin flakes and hair. Much of this type of dirt is oily or sooty in nature. Once the oily soil content of carpets becomes large enough, soil complexes composed of combinations of oily and dry soil begin to form a sticky film that holds other dirt. These complexes adhere to the carpet fibers, binding them together, preventing the efficient removal of soil by normal vacuuming, and causing the carpet to appear dingy.

Spills

Spills usually create the most noticeable contrasts in carpets. They consist of localized high concentrations of soiling matter. When spills first occur, they are in a wet, mobile state. If they are allowed to dry or to penetrate carpet fibers they become difficult stains, which may be impossible to remove.

MAINTENANCE PROGRAMS

Maintenance programs should begin as soon as the carpet is installed. Minimum maintenance will result in decreased use life of the carpet and an increased total cost over the long term. An effective maintenance program involves four elements that combine to preserve the carpet's appearance and extend its wear life. These are *prevention***,** *daily cleaning***,** *periodic cleaning* and *repair*. The maintenance program should be carefully designed to consider traffic loads and soiling rates. Using a floor plan, identify the most likely areas for soiling and spilling. Color code the floor plan to indicate frequencies and procedures for maintenance in critical areas. Plan to give special attention to areas where soil is tracked off, where foot traffic is most concentrated, and where spilling is most likely to occur. Always take immediate action to identify and remove stains and spills.

SOIL PREVENTION

Carpet maintenance can be reduced by taking measures to prevent soiling and the appearance of soil. Some of these measures are careful initial selection of carpet, maintenance of exterior areas, soiling barriers, chair pads, and anti soiling treatments.

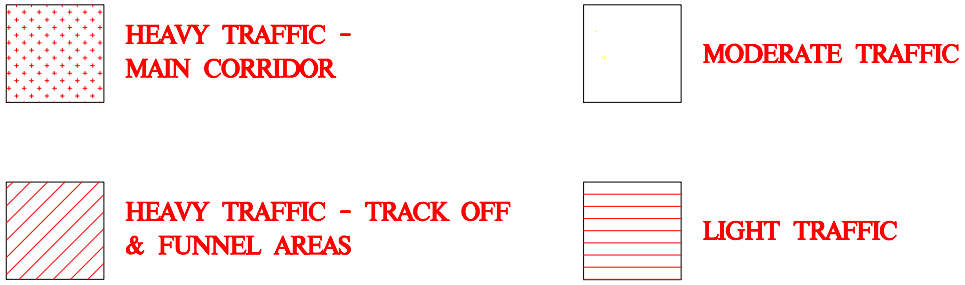
- Careful Carpet Selection**:** Very light colors, dark colors, and solid colors tend to show dirt, while middle toned, multi colored, patterned, tweed and heather carpets camouflage it.
- Maintenance of Exterior areas**:** Parking lots, sidewalks, garages and other exterior areas of a building should be swept often to keep them free from dirt. This will help prevent dirt from being tracked in. When possible, snow and ice should be manually removed rather than being treated with chemicals or sand.
- Soiling Barriers**:** Install walk off mats at entrances and removable carpets in elevators to collect abrasive dirt before it reaches the carpet inside. Walk off mats should be large enough so that at least two or three steps are taken across them before the carpet is stepped on. Elevators with removable carpets also accumulate dirt that would otherwise be tracked into the main carpeted areas.
- Chair pads*:* Chair pads are not needed with most glue down level loop broadloom or carpet tile installations. Chair pads may be required in executive offices that have plush carpet installed over a cushion.
- Anti Soiling Treatments*:* Fluorochemical treatments can help carpets resist soil and stains. They increase vacuuming efficiency by helping oily dirt to release more easily. These treatments are marketed under several patented trade names by carpet manufacturers. Use products formulated for permanent protection rather than ones that are removed by cleaning processes.
- Miscellaneous Prevention Methods*:* There are several additional measures that will help prevent carpet soiling. Use good HVAC filters in the building to decrease the amount of airborne soil. Limit smoking to areas with high exhaust. Designate eating and drinking areas, or reduce the level of beverages in cups. Install floor mats and use heavy garbage bags in areas of likely abuse such as coffee bars and copy areas.

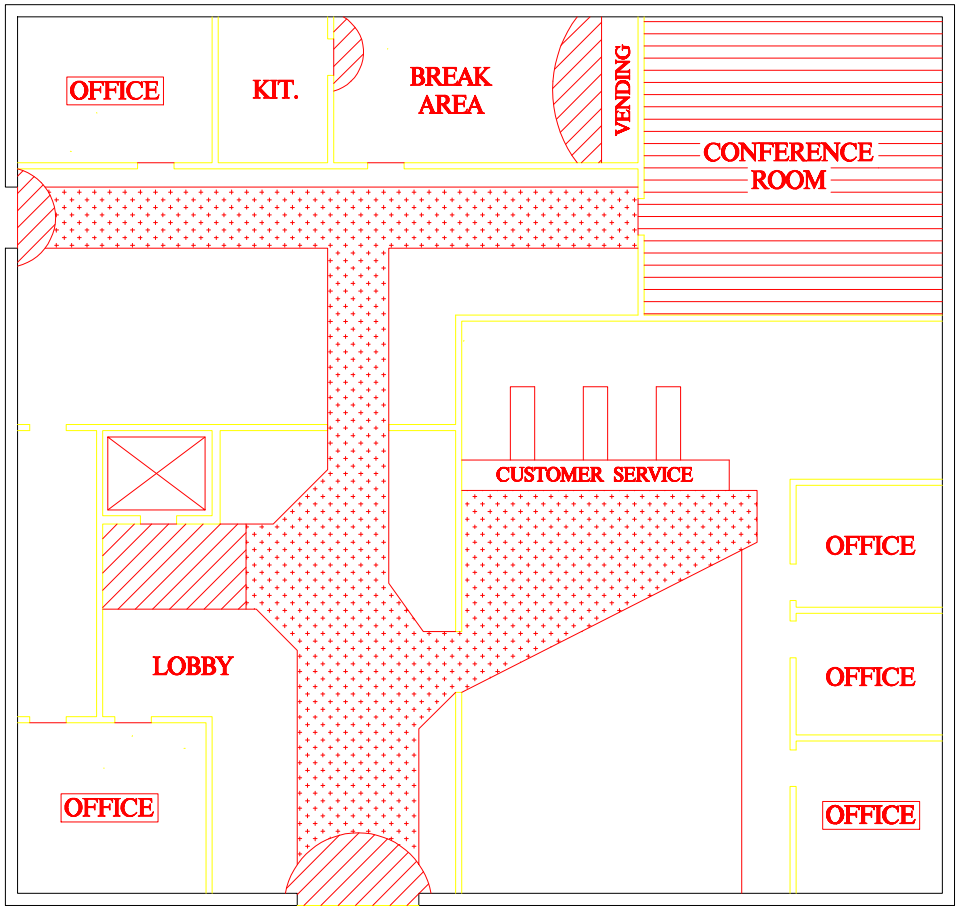
CLEANING PROGRAMS

- Regular cleaning is an essential part of a good maintenance program. Routine vacuuming is the most effective and important of the regular cleaning procedures. Carpeted areas should be classified on the maintenance floor plan as low, medium, or high traffic exposure.(See sample maintenance floor plan on the next page.) High traffic areas should be vacuumed more frequently than low traffic areas. If soiling or traffic patterns change, the vacuuming schedule should be adjusted accordingly. The following schedule should serve as a guide only since every area differs in traffic and soiling rates.
- High Traffic Areas: (Walk off areas, congested channels, and principle passage routes): Vacuum daily.
- Medium Traffic Areas: Vacuum twice weekly (more if needed).
- Light Traffic Areas: Vacuum once or twice weekly (as determined by inspection).

The effectiveness of vacuuming can be determined by a visual examination of the carpet pile. Spread the pile apart with the fingers and inspect the carpet yarns and the back. If loose soil is observed along the yarns and on the back, then more vacuuming is needed. A routine can be established by making several passes over the carpet and then examining the carpet pile for loose soil. If all the soil is not removed, then more vacuuming is required. It is important to remove as much loose soil as possible. It is also important to regularly

inspect the vacuum cleaner for air flow and suction, since a full bag of dirt can inhibit the air flow.





Sample Maintenance Floor Plan

SPOT & STAIN REMOVAL

Spills should be spot cleaned promptly to prevent stains, since stains are difficult or impossible to remove. Although certain chemicals can cause permanent damage to the yarn or dye in a carpet, this damage can be minimized by prompt action.

The first step should be to scrape, blot, or absorb the excess spillage immediately. This quick action may remove the substance before it penetrates the pile of the carpet. If the spot is liquid, absorb it with tissue or paper towels until the absorbent material no longer picks up the liquid. Semi solids should be scraped up gently with a smooth, round object, such as a spoon. Solids or powders respond better to vacuuming.

A spot removal kit should be kept on hand. These are usually available from carpet cleaning, dry cleaning, and janitorial supply houses.

SPOT REMOVAL PROCEDURES	
Type of Spot Oil and Grease	Method of Removal (If more than one method is shown, apply in sequence —until the entire spot is removed)
Asphalt	Dry cleaning fluid
Copier powder	Non-oily paint remover
Cosmetics	Amyl acetate nail polish remover
Crayon	Dry cleaning fluid
Duco Cement	Wet/dry spotter
Grease	Detergent solution
India Ink	5% acetic acid (white vinegar) 3% Ammonia
Oils	Detergent solution
Rubber Cement	Water
Shoe polish	Dry extraction cleaning compound
Tar	

SPOT REMOVAL PROCEDURES	
Type of Spot: Liquids	Method of Removal (If more than one method is shown, apply in sequence until the entire spot is removed)
Beer	Detergent solution
Cocktails	Wet/dry spotter
Coffee	5% acetic acid (white vinegar)
Colas	3% ammonia
Fruit juices	1% Hydrogen peroxide
Soft drinks	Detergent solution
Tea	Water
Tobacco	Dry extraction cleaning compound
Urine	Dry extraction cleaning compound

SPOT REMOVAL PROCEDURES	
Type of Spot: Food and Body Waste	Method of Removal (If more than one method is shown, apply in sequence until the entire spot is removed)
Animal glues	Detergent solution
Blood	3% Ammonia
Catsup	Wet/dry spotter
Chocolate	Detergent solution
Cream	Digestor
Eggs	Detergent solution
Feces	Water
Gravy	Dry extraction cleaning compound
Ice cream	Dry extraction cleaning compound
Starch	Dry extraction cleaning compound
Vomit	Dry extraction cleaning compound

SPOT REMOVAL PROCEDURES	
Type of Spot: Dyes, Inks, Medicines:	Method of Removal (If more than one method is shown, apply in sequence until the entire spot is removed)
Colored paper	Detergent solution
Food	Alcohol
Furniture	5% Acetic acid (white vinegar)
Inks	3% Ammonia
Marking pens	Wet/dry spotter
Medicines	1% Hydrogen peroxide
Soft drinks	Detergent solution Water Dry extraction cleaning compound

SPOT REMOVAL PROCEDURES	
Type of Spot: Chewing Gum, Rust	Method of Removal (If more than one method is shown, apply in sequence until the entire spot is removed)
Chewing gum	Chemical freezing compound (cool with ice until brittle) Dry cleaning fluid
Rust	Rust remover Detergent solution Water

Note**:** When using a dry extraction cleaning compound or dry cleaning fluid, apply it to a towel and blot from outside toward the center. Do not apply directly to the carpet and do not rub it into the carpet.

DEEP CLEANING

Periodic deep cleaning is required to remove oily materials that have become bonded to the carpet fibers, and to collect dirt particles that have been pushed into the spaces between fibers and onto the fibers by the pressure of foot traffic. There are five main methods that are used to clean carpet. There are many variations on the basic methods, multiple names for the same process, and various combinations of methods. Operator training and experience are needed to use any of the methods successfully.

- Absorbent Compound: This method uses the least moisture. A pre-conditioner may be applied before the main treatment in heavily soiled areas. Powder is sprinkled liberally over the surface of the carpet, then worked in with a stiff brush or mechanical agitator. The dirt particles are knocked off the carpet fibers. The chemicals in the powder break the oil bonds and adhere to the dirt particles. The absorbent compound is then removed by vacuuming. The carpet should always be thoroughly vacuumed both before and after using this cleaning method. The carpet will normally take between one and three hours to dry completely.

- Absorbent Pad or Bonnet (dry): This is another minimum moisture system. A solution of detergent and water is sprayed onto the carpet, a rotating pad agitates the carpet tufts, and the dirt is collected in the pad, which is washed out and re-used as needed. The pad or bonnet must be replaced as it becomes saturated with soil in order to prevent resoiling. The cleaning agents should dry to a powder so that they do not leave a sticky residue that acts as a soil collector. Drying time is normally one to three hours, after which the carpet needs to be thoroughly vacuumed. This method is not recommended for cut pile carpet.

- Dry Foam Cleaning: A dry foam detergent solution is produced by means of an air compressor or mechanical agitating device. This foam is then forced down through or around a revolving cylindrical brush, which combs the foam through the carpet pile so each fiber is individually cleaned. The cleaning compounds dissolve oil bonds and encapsulate the dirt particles. Dirt is removed in the foam that is vacuumed from the carpet. Follow up vacuuming when the carpet is dry gets loosened dirt particles out of the pile. The cleaning agents dry to a powder so that they do not leave a sticky residue.

- Shampoo Cleaning: A shampoo solution is fed through a brush into the carpet. A rotating brush agitates the solution into the carpet pile, knocking dirt particles off the fibers and opening up matted carpet pile. The cleaning compounds dissolve the oil bonds and help prevent dirt particles from reattaching to the fibers. Drying time may run from one to twelve hours and up to 24 hours in extreme cases. The cleaning agents should dry to a powder so that they do not leave a sticky residue. Follow up vacuuming is required to remove loosened dirt particles from the pile.

A) Hot Water Extraction (Steam Cleaning): Hot water and detergent are driven down into the carpet under pressure. The cleaning chemicals dissolve oil bonds and prevent dirt particles from reattaching to the fibers. The flushing action of the water gets the loosened dirt particles out of the carpet pile. Maximum drying time is 24 hours.

GLOSSARY

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A

Acrylic - A manufactured fiber in which the fiber forming substance is any long chain synthetic polymer composed of at least 85% by weight of acrylonitrile units. (Acrylics are not recommended for commercial applications.)

Antimicrobial Carpet - Carpet chemically treated to reduce the growth of common bacteria, fungi, yeast, mold, and mildew.

Antistatic - The ability of a carpet system to dissipate an electrostatic charge before it reaches the threshold of human sensitivity.

Appearance Retention (Performance) - The ability of a carpet to maintain its original appearance with use over time. Factors that affect appearance retention are type of fiber, color, pattern, density, pile texture, and maintenance.

Attached Cushion - A cushioning material, such as foam, rubber, urethane, etc., adhered to the backing fabric side of a carpet to provide additional dimensional stability, thickness, and padding.

Average Pile Yarn Weight - Mass per unit area of the pile yarn including portions buried in the backing. In the U.S., this is usually expressed as ounces per square yard.

Axminster Carpet - Carpet woven on an Axminster loom. Pile tufts are individually inserted from varied colored yarns arranged on spools. This process makes it possible to produce carpet and rugs of complex designs with many colors, such as Oriental design rugs.

B

Backing - Materials (fabrics or yarns) comprising the back of the carpet as opposed to the carpet pile or face.

1. Primary Backing - In tufted carpet, a woven or non woven fabric in which the pile yarn is inserted by the tufting needles. Usually, woven or non woven polypropylene for carpet, and often, cotton duck for scatter rugs.
2. Secondary Backing - In tufted carpet, the fabric laminated to the back of carpet to reinforce and increase dimensional stability. Usually, woven jute or woven or non woven polypropylene. (Jute backing is not recommended due to its inability to withstand moisture and humidity.)
3. Woven Carpet Backings - the construction yarns comprising chain warp, stuffer warp, and shot or fill which are interwoven with the face yarn during carpet fabric formation.

Back Seams - Installation seams made with the carpet turned over or face down. Opposite of "face seams" made with the carpet face up. (Both kinds of seam are on the back of the carpet.)

BCF - Abbreviation for *bulked continuous filament*. Continuous strands of synthetic fiber formed into yarn bundles of a given number of filaments and texturized to increase bulk and cover. Texturizing changes the straight filaments into kinked or curled configurations.

Bearding - Long fiber fuzz on carpet caused by fiber snagging and inadequate anchorage.

Berber - A carpet constructed with coarse yarns having randomly spaced flecks of color against a background of a base color.

Binding - A band or strip sewn over a carpet edge to protect, strengthen, or decorate the edge.

Bleeding - Transfer of fiber dyes from carpet or other fabrics by a liquid, usually water, with subsequent redepositing on other fibers.

Blend - A mixture of two or more types of yarn or fiber.

Bonded Carpet - Bonded or fusion bonded carpet Is a kind of tufted carpet made by inserting pile yarn directly into liquid vinyl plastisol. These components are then fused together. This produces a carpet with a continuous impermeable vinyl back and with a tuft lock superior to any other cut pile carpet construction. Solid color, heather, and prints on base carpeting can be produced by the bonding process.

Breaking Strength - The ultimate tensile load or force required to rupture a material.

Broadloom - A term used to denote carpet produced in widths wider than six feet.

C

Carpet Cushion - A term used to describe any kind of material placed under carpet to provide softness and adequate support. It usually provides added acoustical benefits and longer wear life for the carpet. In some cases, the carpet cushion is attached to the carpet when it is manufactured. Also referred to as "lining," "padding," or "underlay," although "carpet cushion" is the preferred term.

Carpet Modules - Carpet packaged as squares, generally 18 inches by 18 inches (457 x 457 mm), with or without attached cushion backing. Also referred to as "carpet tiles."

Construction - Carpet construction is defined by stating the manufacturing method (tufted, woven, etc.) and the final arrangement of materials achieved by following the specifications.

Continuous Dyeing - Process of dyeing carpet in a continuous production line, rather than in batch lots. In continuous dyeing, special equipment flows dyestuff onto the carpet, as opposed to batch lot dyeing where the carpet is submerged in separate dye becks.

Continuous Filament - A process in which continuous strands of synthetic fibers are extruded into yarn rather than spun like natural fibers and synthetic staple fibers.

Count - 1. A number identifying yarn size or weight per unit length or vice versa (depending on the particular system being used.) 2. The number of warp ends and filling ends per inch of a fabric.

Crocking - Term used to describe excess color rubbing off because of improper dye penetration, fixation, or selection.

Cross Seams - Seams made by joining the ends of carpet together.

Cushion Back Carpet - A carpet having a cushioning lining, padding, or underlay material as an integral part of its backing. Same as attached cushion carpet.

Cut - A length of carpet cut from a full roll to fill an order.

Cut Pile- A carpet or fabric in which the face is composed of cut ends of pile yarn.

D

Delamination - Separation of the secondary backing or attached cushion from the primary backing of the carpet.

Delamination Strength - Force required to remove secondary backing from a finished carpet.

Denier - A direct numbering system for expressing the linear density of a yarn, filament, fiber, or other textile strand. The denier is equal to the mass in grams per 9000 meters of fiber. The higher the denier, the larger the yarn or fiber.

Density, Average Pile - The weight of pile yarn in a unit volume of carpet expressed in ounces per cubic yard is given by the formula

$$D = \frac{W \times 36}{T}$$

in which **D** is density, **W** is pile yarn weight in ounces per square yard, and **T** is pile thickness (height) in inches.

Dimensional Stability - The ability of a fabric to retain its original size and shape; may be enhanced by chemical treatments or by mechanical means, such as the secondary backing.

Direct Glue Down - Installation process where carpet is adhered directly to the subfloor without a cushion.

Double Glue Down - An installation method whereby the carpet cushion is adhered to the subfloor with an adhesive, and then the carpet is adhered to the cushion by another adhesive.

Drop Match - See *match*.

Dry Compound Cleaner - A carpet cleaning preparation consisting of absorbent granules impregnated with dry cleaning fluids, detergents, and other cleaners. The dry powder is sprinkled on the carpet, worked into the pile with a brush, left to absorb soil for a short time, and then removed along with the absorbed soil by vacuuming.

Dry Foam - A detergent solution containing only a small amount of water. It is mechanically worked into the surface of the carpet, and the loose soil is then removed by vacuuming.

Dry Rot - A condition caused by micro organisms attacking fibers of textiles, carpets, or other materials, which results in decreased strength and integrity. Dry rot in carpet backings permits carpet to break and tear easily. Natural materials such as jute are susceptible to dry rot, but polypropylene and most other synthetics are resistant.

Dyeing - Coloring fibers, yarns, fabrics, carpet or other materials by addition or incorporation of small amounts of highly colored materials known as dyes and pigments. See individual dye methods, including *piece dyeing*, *continuous dyeing*, *space dyeing*, *skein dyeing*, *stock dyeing*, *printing*, and *solution dyeing*.

Dye Lots - When carpet is dyed by certain methods, several separate tanks of dye solution (dye lots) may have to be prepared to dye the total number of square yards of carpet specified for an installation. As a result, the carpet may vary slightly in color from one dye lot to the next. Carpet from one dye lot should not be installed right beside carpet from a different dye lot.

F

Face Seams - Sewn or cemented seams made without turning the carpet face down. They are used during installation when back seaming is not possible.

Face Weight - The weight of the carpet pile including those portions of the pile that extend into the backing structure. Generally expressed in ounces per square yard.

Fadeometer - A laboratory device for determining the effects of light on the properties of yarns, fibers, fabrics, carpet, plastic, and other materials. It uses a standard light source to simulate the spectrum of sunlight. It is generally used for measuring fade resistance of carpet colors, which are rated according to the number of units exposure required to produce visible loss of color.

Fading - Loss of color. Caused by actinic radiation, such as sunlight or artificial light; atmospheric gases, including ozone, nitric oxide, and hydrogen sulfide; cleaning and bleaching chemicals, such as sodium hypochlorite and other household and industrial products, chlorine chemicals for swimming pools, and other factors. Colorfast carpet for commercial installations prone to these exposures should be selected with extreme care.

Fastness - Retention of color by carpet or other materials, usually with reference to specific exposures, e.g., light fastness and wash fastness. Dyestuff, fiber type, and dyeing method influence the ability of colored carpets and fabrics to withstand the effects of color destroying agents.

Fiber - The natural or man made substance which forms the basic element of fabrics and other textile structures. Fiber is defined as having a length at least 100 times its diameter or width. Useful textile fibers have high tensile strengths, flexibility, and resistance to heat, light, chemicals, and abrasives.

Filament - A single continuous strand of natural or synthetic fiber.

Filling Yarns - The yarns that run widthwise in a woven carpet. There may be several sets of filling yarns in a complicated pattern.

Finishing - A collective term denoting final processing of carpet and textiles subsequent to tufting, weaving, and dyeing. Carpet finishing processes include shearing, brushing, application of secondary backing, application of attached foam cushion, application of soil retardant and anti static chemicals, back beating, and steaming.

Flooring, Radiant Panel - Laboratory testing device for measuring critical radiant flux on horizontally mounted floor covering systems exposed to a flaming ignition source in a graded radiant heat energy environment.

Fluffing - Appearance on carpet surface of loose fiber fragments left during manufacture; not a defect, but a characteristic that disappears after carpet use and vacuuming. Sometimes called "fuzzing" or "shedding."

Frisé - Pronounced “free-zay“ - 1) A tightly twisted yarn that gives a rough, nubby appearance to carpet pile and carpet. 2) Carpet or textile having the rough, nubby appearance described above.

Full Roll - A length of carpet roll goods approximately 100 feet long; also called a shipping roll by carpet manufacturers. Shipping roll standards vary and may be as short as 30 feet, depending upon carpet thickness and manufacturers' quality criteria. In the United States almost all roll goods are 12 or 15 feet wide, with 12 foot width the most prevalent.

G

Gage or Gauge - The distance between two needle points expressed in fractions of an inch. Applies to both knitting and tufting.

Gauge/Pitch - The number of ends of surface yarn counting across the width of carpet.

For tufted carpet, gauge is the standard of measurement. Gauge is obtained by counting the number of ends of yarn in one inch across the carpet and then taking the inverse of that number (I. e. one over the number.)

If a tufted carpet has eight ends of yarn per inch, the gauge is 1/8. If it has ten ends of yarn per inch, the gauge is 1/10.

For woven carpet, pitch is the standard of measurement. Pitch is obtained by counting the number of ends of yarn in 27 inches of width.

If a woven carpet has eight ends per inch, the pitch is 216, or 8 x 27. If it has ten ends per inch, the pitch is 270, or 10 x 27.

To convert gauge to pitch, take the inverse of the gauge and multiply by 27. For example, if the gauge is 1/8, taking the inverse gives 8, and multiplying by 27 gives a pitch of 216.

Glue Down - An installation method whereby the carpet is adhered to the floor with adhesive.

Ground Color - The background color against which the top colors create a pattern or figure in the design.

H

Hand - The tactile aesthetic qualities of carpet and textiles. Factors that determine how a carpet feels to the hand include pile weight, stiffness, lubricants, fiber type, denier, density, and backing.

Heather - A multicolor effect provided by blending fibers of different colors prior to spinning carpet yarn.

Heat Setting - A process for stabilization of carpet yarns by exposure to heat. Conventional autoclave heat setting treats yarns in relaxed skein configuration with pressurized steam, usually at temperatures in the 240 to 400 degrees F range. The principal benefits are twist retention in plied yarns in cut pile carpet and general stabilization of yarn configuration.

Heatset Yarn - Carpet yarns thermally stabilized to a final crimp or twist configuration so as to reduce loss of twist and bulk in service.

High-Low - Multi-level carpet style combining high and low loop pile areas or high cut pile and low loop areas. The latter is also called cut and loop.

Hue - A color itself, as red or blue. Many tones of the same hue are possible. A tint is made by adding white to a hue, , and a shade is made by adding black to a hue.

J

Jute - A natural bast fiber made from certain plants of the linden family, which grown in warm climates, such as India and Bangladesh. Jute yarns are used for woven carpet construction (backing) yarns. Woven jute fabrics are used in tufted carpet as secondary backing.

K

Knee Kicker - A carpet installation tool consisting of a pinned plate connected to a short section of metal tubing. The end of the tubing opposite the plate has a padded cushion that the installer strikes with his knee to position carpet, which is gripped by the pinned plate.

In general, adequate stretching of carpet installations cannot be achieved with knee kickers. A power stretcher should always be used for stretching carpet during installation.

Knitted Carpet - A type of woven carpet produced in a fabric formation process by interlacing yarns in a series of connected loops. Pile and backing are produced simultaneously as multiple sets of needles interlace pile, backing and stitching yarns in one operation.

L

Latex - A compound consisting of either natural or synthetic rubber which is used to coat the back of carpet or rugs in order to adhere carpet components to one another. Most carpet latex consists of styrene-butadiene synthetic rubber (SBR) compounded with powdered fillers, such as calcium carbonate.

Level Loop - A carpet construction in which the yarn on the face of the carpet forms a loop with both ends anchored into the carpet back. The pile loops are of substantially the same height and are uncut, making a smooth and level surface.

Loop Pile - Carpet style having a pile surface consisting of uncut loops. May be woven or tufted. Also called "round wire" in woven carpet terminology.

Luster - Brightness or sheen of fibers, yarns, carpet, or fabrics. Synthetic fibers are produced in various luster classifications including bright, semi bright, semi dull, and dull. Bright fibers usually are clear (have no white pigment); whereas the duller designations have small amounts of white pigments such as titanium dioxide. Luster of finished carpet also depends upon yarn heat setting methods, dyeing, and finishing. In high traffic commercial areas, duller carpet is often preferred for its soil hiding ability.

M

Match, Set or Drop - The arrangement and dimensions of the repeating units that comprise the design of a patterned carpet, including woven patterns, prints, tufted high-lows, and others. A typical pattern repeat might be 36 inches wide x 24 inches long.

In set match, the rectangular pattern unit is arranged in parallel rows across the carpet width.

In drop match, each pattern unit is lowered a certain amount along the carpet length with respect to the pattern unit it adjoins. In a half drop match, the start of each pattern repeat unit is transposed to the midpoint of the side of the adjacent unit. In the 24” x 36” example given above, each adjacent unit would start 12 inches down the side of the neighboring one. In quarter drop match, each unit in the example would start six inches past the neighboring pattern unit's starting point.

Thus, pattern repeat units in drop match repeat diagonally across the width, and in set-match, they repeat straight across the width perpendicular to the length. Pattern repeat dimensions and match are significant to specifiers and purchasing agents because they influence the amount of excess carpet (over the measured area) needed in multiple width installations.

Matting - Severe pile crush combined with entanglement of fibers and tufts.

Metallic Fiber - Fiber made of metal, metal coated plastic, or plastic coated metal sometimes used in small amounts in carpet to dissipate static electricity and prevent shock.

Molding - A wooden or plastic strip attached to the bottom of a baseboard or wall to cover the joint between wall and floor.

Monofilament - A single, continuous strand of synthetic polymer in the form of a filament large and strong enough to be used as a textile yarn.

Multifilament - Synthetic yarns composed of a multiplicity of continuous fiber strands extruded together, usually from the multiple holes of a single spinneret. Multifilament carpet yarns are texturized to increase bulk and cover and are called "bulked continuous filament" yarns or BCF yarns.

N

Needle, Axminster Weave - An eyed needle that delivers filling yarn across the loom through the warp yarn shed.

Needle, Knitting - Hooked needles that form the loops of knitted fabric.

Needle, Needlepunching - Barbed felting needles that entangle and compress fibrous fleeces into needled felts, such as those used for outdoor carpet.

Needle, Tufting - An eyed needle that inserts yarns into primary backing to form tufts.

Nylon - Synthetic thermoplastic of the polyamide family widely used as a carpet face yarn in either BCF or staple yarn form. Two chemical types, nylon-6,6 and nylon-6, are used in carpet. Nylon-6,6 is polyhexamethylene adipamide and nylon-6 is polycaprolactam.

O

Olefins - Any long chain, synthetic polymer composed of at least 85% by weight of ethylene, propylene, or other olefin units. Polypropylene is used in carpet as both backing and as pile fiber. See Polypropylene.

Oriental Rug - Hand-woven rug made in the Middle East or Asia.

Outdoor Carpet - Carpet that may be used outdoors without rapid fading or deterioration. The principal requirements are resistance to sunlight and to water. Most outdoor carpet pile yarns are solution-dyed polypropylene containing ultraviolet stabilization additives. Coatings and backing materials are synthetics that are water and rot resistant.

P

Pattern - Decorative design on a carpet. It may be printed, woven with colored yarns, or sculptured in multiple pile heights.

Pile - The visible wear surface of carpet consisting of yarn tufts in loop and/or cut configuration. Sometimes called "face" or "nap."

Pile Crush - Loss of pile thickness due to compression and bending of tufts caused by traffic and heavy furniture. The tufts collapse into the air space between them. If the yarn has inadequate resilience, and/or the pile has insufficient density for the traffic load it may be irreversible.

Pile or Tuft Length - The length of the extended tufts measured from the primary backing top surface to their tips. Pile tufts should be gently extended, not stretched during this measurement.

Pile Setting - A procedure in carpet cleaning in which the damp and disheveled pile is lifted after shampooing by a pile brush or pile lifting machine.

Pile Yarn - The yarn that forms the tufts of the carpet. Also called "face yarn."

Pilling - A condition of the carpet face in which fibers from different tufts become entangled with one another, forming hard masses of fibers and tangled tufts. Pillling can be caused by heavy traffic. Pills may be cut off with scissors.

Pill Test - Flammability test for carpet to determine its ease of ignition by a small incendiary source, i.e., a methenamine timed burning tablet. Federal regulations require all carpet sold to pass the pill test (FF1-70).

Pitch - See gauge/pitch.

Plied Yarn - A yarn composed of two or more single yarns twisted together. Many 2 ply yarns are used in carpet. In a cut pile carpet such as a saxony, plied yarns must be heat set to prevent untwisting under traffic. Multiple continuous filament yarns are sometimes air entangled rather than twisted.

Plush Finish - A smooth textured carpet surface in which individual tufts are only minimally visible, and the overall visual effect is that of a single level of fiber ends. This finish is normally achieved only on cut pile carpet produced from non heat set single spun yarns by brushing and shearing. It is sometimes called "velvet plush."

Ply - 1. A single end component in a plied yarn. 2. The number which tells how many single ends have been ply twisted together to form a plied yarn, for example, 2-ply or 3-ply.

Polyester - A fiber-forming, thermoplastic synthetic polymer. Nearly all polyester carpet fiber is staple, and the yarns are spun yarns. Polyester for carpet is made from terephthalic acid and ethylene glycol and is known chemically as polyethylene terephthatlate.

Polymers - High molecular weight chemical compounds formed by repeated linking of smaller chemical units called monomers. Polymers from which fibers are made are long chain molecules in which the monomers are linked end to end in a linear fashion. Synthetic polymers used for carpet fiber include nylon-6,6 and nylon-6 (polyamides), polyester, polypropylene, and polyacrylonitrile (acrylics). In popular terminology, polymers are also called plastics or resins.

Polypropylene - Synthetic, thermoplastic polymer used for molded items, sheets, films, and fibers. The Federal Trade Commission (U.S. Government) classification is olefin. This polymer is made by stereospecific polymerization of propylene. Most polypropylene carpet fiber is solution dyed and sometimes contains ultraviolet stabilizers for outdoor use. The carpet fiber is available as both bulked continuous filament yarns and staple for spun yarn production. Slit film polypropylene is used in woven carpet backing.

Power Stretcher - A carpet installation tool used to stretch carpet for installation on tackless strip. It consists of a pinned plate that grips the carpet, tubular extensions, a padded end that is used to brace against an opposing wall or other structure, and a lever system that multiplies the installer's applied stretching force.

Primary Backing - A component of tufted carpet consisting of woven or non woven fabric into which pile yarn tufts are inserted by the tufting needles. It is the carrier fabric for the pile yarn, and should not be confused with secondary backing, which is a reinforcing fabric laminated to the back of tufted carpet subsequent to the tufting process. Most primary backing is either woven or non woven polypropylene. Some synthetic primary backings have nylon fiber attached to their upper surfaces to make them union dyeable with nylon pile yarns.

Prime Urethane Cushion - Separate carpet cushion made from virgin polyurethane foam. The sheet of foam is cut from large "loaves." As opposed to prime cushion, rebonded polyurethane is made from recovered scrap.

Printed Carpet - Carpet having colored patterns applied by methods analogous to those used for printing flat textiles and paper. These include flatbed screen printing using woven fabric screen, rotary screen printing with perforated sheet steel screens, Stalwart printing with sponge rubber pattern elements on wooden rollers, and computer programmed jet printing.

R

Random Sheared - A carpet texture created by shearing either level loop or high-low loop carpet lightly so that only the higher loops are sheared. The sheared areas are less reflective than the unsheared loops, which appear brighter and lighter in color. Random shearing of high-low loop carpet produces a texture somewhat similar to cut and loop.

Repeat - The dimensions of the basic pattern unit in any type of patterned carpet including printed, woven, high-low tufted loop, cut and loop, etc. See match for further discussion.

Resilience - The ability of carpet pile or cushion to recover original thickness after being subjected to compressive forces or crushing under traffic.

Restretch - A carpet installation term used to describe carpet stretching performed subsequent to original installation in order to remove wrinkles, bubbles, or loose fit. Most restretching is caused by failure of the installer to adequately stretch the carpet during original installation. Restretching should be performed with power stretchers and not with knee kickers, as should all stretching operations in overpad, tackless strip installations.

Rotary Brushing - A carpet cleaning technique in which a detergent solution is worked into the pile by a motor-driven rotating brush. Loosened soil and spent solution is often subsequently removed by vacuuming.

Rows or Wires - In woven carpet, the number of pile yarn tufts per running inch lengthwise. Called "rows" in Axminster and "wires" in Wilton and velvet carpet. Analogous to "stitches per inch" in tufted carpet.

Rubber - A term sometimes applied to carpet cushion made from rubber (foam or sponge), which is used for both separate and attached cushion.

Rug - Carpet cut into room or area dimensions and loose laid.

S

Saxony - A cut pile carpet texture consisting of heat set plied yarns in a relatively dense, erect configuration, with well defined individual tuft tips. Tip definition is more pronounced than in singles plush.

Sculptured - Any carpet pattern formed from high and low pile areas, such as high-low loop or cut and loop.

SECONDARY BACKING - Woven or nonwoven fabric reinforcement laminated to the back of tufted carpet, usually with latex adhesive, to enhance dimensional stability, strength, stretch resistance, lay flat stiffness, and hand. Most secondary backings are woven jute, woven polypropylene, or nonwoven polypropylene. The term is sometimes used in a broader sense to include attached cushion and other polymeric back coatings. Because secondary backing is visible, whereas primary backing is concealed under the pile

yarn in finished carpet, most dealers and installers refer to the secondary backing simply as "backing."

Self-Tone - A pattern of two or more tones of the same color. When two tones are used in a pattern or design, it is called "two-tone."

Selvages - Carpet edges at sides of rolls.

Serging - A method of finishing edges of carpet base or area rugs cut from roll goods by use of heavy, colored yarn sewn around the edges in a close, overcast stitch.

Shade - A hue (color) produced by a pigment or dye mixture with some black in it.

Shading - A change in the appearance of a carpet due to localized distortions in the orientation of the fibers, tufts, or loops. Shading is not a change in color or hue, but a difference in light reflection. It is sometimes referred to as "temporary shading," "tracking," or "pile reversal."

Shag - A carpet texture characterized by long pile tufts laid over in random directions in such a manner that the sides of the yarn form the traffic surface. Modern shags are made from plied, heat-set yarns and are either cut pile or cut and loop styles.

Shearing - Carpet manufacturing process for producing a smooth carpet face, removing fuzz, or creating random sheared textures. Carpet shears have many steel blades mounted on rotating cylinders that cut fibers on carpet surfaces in a manner analogous to a lawn mower cutting grass. Depth of shearing may be indicated by a modifying word, e.g., defuzz and tip shear suggest a shallow cut, whereas a full shear implies a deep cut such as is used for producing mirror finished plush.

Side Seams - Seams running the length of the carpet. Sometimes called length seams.

Skein Dyed Yarn - Pile yarn dyed while loosely wound in large skeins.

Soil Resist Treatment - Application of a chemical agent that gives low surface energy properties to carpet face fiber, in order to inhibit wetting of the fibers by oil or water based materials. Treatments are usually fluoro-chemically based.

Soil Retardant - A chemical finish applied to fibers or carpet and fabric surfaces, which inhibits attachment of soil.

Solution Dyed Fiber - Synthetic fiber colored by pigments dispersed in the polymer melt or solution prior to extrusion into fiber. Sometimes referred to as dope dyed or spun dyed.

Space Dyed - Yarn dyed in two or more colors that alternate along the length.

Spinning - A term used in yarn or fiber production. To a fiber manufacturer, spinning is synonymous with extrusion of polymer through the small holes of the spinneret into synthetic fiber. To the conventional textile yarn mill, spinning is the conversion of staple fiber into spun yarn.

Sponge Cushion - Carpet cushion of rubber foam material that is chemically blown to form a cushion product.

Stain - Foreign material (soil, liquids, etc.) on carpet that is not removable by standard cleaning methods.

Stain Resist Treatment - Chemical treatment, primarily for nylon carpet, to minimize stains from food colors. Chemical stain resist treatments are not commonly used for commercial carpet.

Staple FIber - Short lengths of fiber, which may be converted into spun yarns by textile yarn spinning processes. Also called "staple." Staple may also be converted directly into nonwoven fabrics, such as needle-punched carpet. For carpet yarns spun on the common modified worsted systems, most staple is six to eight inches long.

Static Shock - Discharge of electrostatic charge from carpet through a person to a conductive ground such as a doorknob. The friction of shoes against carpet fiber causes the build up of an electrostatic charge. Various static control systems and finishes are used for contract carpet to dissipate static charge before it builds to the human sensitivity threshold.

Stay Tacking - A carpet installation term for temporary nailing or tacking to hold the stretch until the entire installation is stretched over and fastened onto the tackless strip. An important technique in large contract installations, which are too large to stretch in one step.

Stiffness - Resistance of a material to bending.

Stitches - Stitches per inch. The number of yarn tufts per running inch of a single tuft row in tufted carpet.

Stitch Length - Total length of yarn from which a tuft is made. It is numerically equal to twice the pile height plus the associated back stitch behind the primary backing.

Stock Dyed Yarn - Colored spun yarn produced from fibers dyed in staple form. The term does not apply to yarns spun from solution dyed staple.

Streak - Any lengthwise, narrow, visual defect in carpet. Dye streaks may be caused by a single pile end having different dye affinity from the others. Other streaks may be yarn defects, such as tight twist, stretched yarn, or yarns larger or smaller than the rest.

Stretch - A carpet installation term for the amount of elongation of carpet when it is stretched over cushion onto tackless strip. Generally one to two percent.

Stretch-In - Installation procedure for installing carpet over separate cushion using a tackless strip.

Stuffer - A backing yarn in woven carpet. Stuffers are normally large warp yarns (lengthwise yarns) which add weight, strength, hand, stiffness, and stability.

Swatch - A small carpet sample. Carpet specifiers should retain swatches to verify color, texture, weight, and other quality factors when carpet is delivered.

T

Tackless Strip - Wood or metal strips fastened to the floor near the walls of a room containing either two or three rows of pins angled toward the walls, on which the carpet backing is stretched and secured in a stretch in installation.

Tensile Strength - The greatest stretching force a material such as a yarn, fabric, or carpet can bear without breaking.

Texture - Visual and tactile surface characteristics of carpet pile, depending on such aesthetic and structural elements as high-low or cut and loop patterning, yarn twist, pile erectness or lay over, harshness or softness to the touch, luster, and yarn dimensions.

Thermal Conductivity - Ability of a material to transmit heat. Good insulators, including some carpet, have high thermal resistivity (R-value) and low thermal conductivity.

Tip Shearing - Light, shallow shearing to add surface interest to carpet texture or to clean up and defuzz carpet during finishing.

Top Colors - In printed or woven colored patterns, top colors are the ones forming the pattern elements, as distinguished from background or ground colors.

Total Weight - Weight per square yard of the total carpet pile, yarn, primary and secondary backings, and coatings.

Traffic - The passing back and forth of people and equipment over a carpet surface area.

Tuft Bind - Force required to pull a tuft from the carpet.

Tufted Carpet - Carpet manufactured by the tufting process, which involves insertion of pile tufts by a row of eyed needles that penetrate a primary backing fabric, thus forming tufts from the yarn threaded through the eyes of the tufting needles.

Tufts - The cut or uncut loops of a pile fabric.

Twist - The number of turns per unit length about the axis of a yarn. Twist direction is either right or left handed, also called "Z-twist" or "S-twist." Carpet yarns usually have rather low twists, in the 2.5 to 6.0 turns per inch (TPI) range, with the majority from 3.5 to 5.0 TPI.

Twist Carpet - Carpet having a pile texture created with tightly twisted yarns in which the ply twist is substantially greater than the singles twist, causing the yarn to curl. Most twist styles are cut pile, and the unbalanced, hard twist causes a nubby texture. See also frisé.

Twist Retention - The ability of heat set yarns to retain their twist. The stronger the yarn twist, the better the appearance retention of the carpet will be, particularly in cut pile carpet.

U

Underlay - See Carpet Cushion.

Unitary Carpet - Type of carpet used for glue down installations that has an application of high quality backcoating latex to increase tuft bind performance properties without the addition of a secondary backing.

V

Velvet Carpet - Carpet woven on a velvet loom. Velvet carpet is typically cut pile or level loop in solid or tweed colorings, though textured and patterned effects are possible.

Velvet Finish - A smooth surface texture on dense plush carpet.

Vinyl - Colloquial term for the synthetic polymer, polyvinyl chloride (PVC). PVC is used as a carpet back coating for marine and outdoor use. PVC foams can be used as attached cushions. Many walk off mats have solid, sheet vinyl backings, and carpet modules (tiles) are also often PVC backed.

W

Warp - A weaving term for yarns that run lengthwise in woven fabrics and carpets. Warp yarns are usually delivered to the loom from a beam, a large spool with hundreds of ends of yarn wound on it and mounted behind the loom. Woven carpets usually have three sets of warp yarns, which may be wound on three beams. These include stuffer warp for lengthwise strength and stiffness, pile warp, which forms the carpet surface tufts, and chain warp, which interlaces with fill yarn to lock the structure together.

Watermarking - A special case of non reversible shading where large areas of the carpet appear randomly light or dark. The term "watermarking" stems from the fact that this type of shading looks like puddles of water. The appearance is due to adjacent tuft areas leaning in opposite directions, reflecting different amounts of light from the tips and sides. Extensive research has shown that this condition is not a manufacturing defect, and the cause remains unknown.

Weaving - A fabric formation process used for manufacturing carpet in which yarns are interlaced to form cloth. The weaving loom interlaces lengthwise (warp) and widthwise (filling) yarns. Carpet weaves are complex, often involving several sets of warp and filling yarns. See Axminster, Wilton, Velvet, and Knitted.

Weft - Yarn which runs widthwise in woven cloth or carpet, interlacing with the warp yarns. Also called filling yarns.

Wilton Carpet - Carpet woven on a loom with a Jacquard mechanism, which utilizes a series of punched cards to select pile height and yarn color. The Wilton loom can produce carpet with complex multicolor patterns and highly textured pile surfaces of multilevel cut and looped yarns.

Woven Backing - A term for primary or secondary backing that is manufactured for tufted carpet by the weaving process. Secondary backings are usually woven jute or woven polypropylene. Primary backings are usually woven (or nonwoven) polypropylene.

Woven Carpet - Carpet produced on a loom through a weaving process by which the lengthwise (warp) yarns and widthwise (weft or filling) yarns are interlaced to form the fabric. Carpet weaves such as Wilton, Axminster and velvet are complex, often involving several sets of warp and filling yarns for the pile and backing.

X, Y, Z

Yarn - A continuous strand composed of fibers or filaments and used in tufting, weaving, and knitting to form carpet and other fabrics. Carpet yarn is often plied and may be either spun from staple or extruded as a continuous filament.

Yarn Dyeing - Dyeing yarn before tufting or weaving it into carpet.

Yarn Ply - The number of singles yarns ply twisted together to form a plied yarn.

Yarn Size - Same as yarn count. See Count.

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